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## The pedunculate species of *Trillium*

HENRY ALLAN GLEASON

About forty specific names and a correspondingly large number of varietal ones have been proposed for the pedunculate species of *Trillium* during the century and a half that has elapsed since the publication of the *Species Plantarum*. Linnaeus himself left the genus in some confusion by including two species under the name *T. cernuum*. Others added to it by imperfect descriptions and incorrect citations, and Rafinesque complicated matters still further by the publication of a large number of species the identity of which will probably never be satisfactorily established. Gray, Watson, and Harbison have all contributed in bringing order into the genus, and more recently Rendle has published such careful descriptions of the types of the Linnaean species that they are no longer in doubt.

The species fall into three very natural groups separated by the character of the stigmas and ovary. In the first of these, which may be designated the *T. erectum* type, the ovary is deeply and sharply six-lobed, and the members of each pair of lobes, corresponding with one of the three carpels, unite above into a short thick sessile recurved stigma, which tapers gradually to the tip. In the second, the *T. grandiflorum* type, the ovary is less deeply angled or even merely three-lobed; it is truncate, rounded, or somewhat narrowed at the end; and the stigmas are slender and of virtually uniform diameter throughout. *T. rivale* S. Watson is included in this group because of Watson's statement that it is related to *T. nivale*. The material available for examination was too fragmentary to determine accurately the character of the stigma. In the last, or *T. Catesbaei* type, the stigmas are likewise slender and of uniform diameter, but they are united below into a definite style. These distinctions are not only constant, but they are very striking, and characters of no greater importance have been used in other families for the segregation of genera.

Within the three groups thus separated by the structure of the

stigmas, the species are distinguished most certainly by the length of the filaments and anthers, supplemented by the color of the petals and ovary, and the length and position of the peduncle. The absolute length of the stamens may be lessened considerably by drying, but in that case the shrinkage is uniform, so that the proportionate lengths of filaments and anthers remain unchanged. The other specific characters, while quite typical of many species, are either subject to considerable variation in nature or are easily altered by pressing. The color of the ovary, for certain forms at least, is quite constant. A very few species, such as *T. undulatum* and *T. nivale*, may be distinguished by the shape of the leaves, but in general the leaves and stems of all the species are very similar.

No attempt has been made to provide exhaustive descriptions of the species. In some cases the characters used in the key include all of the typical features; in other cases a few additional descriptive notes have been added in the text.

#### Key to the species

Stigmas sessile, short, stout, tapering from the base to the apex, recurved at the tip, their length about half that of the 6-angled or 6-winged ovary.

North American species; petals white, pink, or dark purple.

Ovary white or with a tinge of pink; petals white or rarely pink; peduncle nodding or horizontal.

Filaments one half as long as the anthers, or shorter. 1. *T. declinatum*.

Filaments two thirds as long as the anthers, or longer. 2. *T. cernuum*.

Ovary dark-purple or nearly black; petals white to dark-purple; peduncle erect or declined, or rarely nodding.

Filaments 8-12 mm. long, approximately equaling the anthers. 3. *T. Vaseyi*.

Filaments 2-6 mm. long, shorter than the anthers or very rarely subequal to them.

Stamens 15 mm. long or more, much exceeding the stigmas. 4. *T. simile*.

Stamens 13 mm. long or less, equaling or shorter than the stigmas.

Anthers purple, 8-10 mm. long, 2-3 times as long as the filaments. 5. *T. Rugelii*.

Anthers yellow, 5-9 mm. long, 1.2-2 times as long as the filaments. 6. *T. erectum*.

Species of eastern Asia and Japan; petals white or none.

- Petals none or abortive. 7. *T. Smallii*.
- Petals present.
- Anthers about equaling the filaments, 4-6.5 mm. long. 8. *T. Tschonoskii*.
- Anthers 2-3 times as long as the filaments, about 10 mm. long. 9. *T. camschatcense*.
- Stigmas sessile, usually more than half as long as the ovary, slender and of uniform diameter throughout, erect or spreading, or somewhat recurved.
- Ovary 3-lobed.
- Petals very narrow, less than half as wide as the sepals. 10. *T. Govanianum*.
- Petals much broader than the sepals.
- Ovary tapering at the tip; peduncle exceeding the leaves. 11. *T. rivale*.
- Ovary truncate or rounded; peduncle shorter than the leaves.
- Leaves oblong, acute. 12. *T. nivale*.
- Leaves ovate, acuminate. 13. *T. undulatum*.
- Ovary 6-angled.
- Filaments one-half to two-thirds as long as the anthers. 14. *T. Scouleri*.
- Filaments equaling the anthers, or barely shorter than them.
- Stamens 15 mm. long or more; stigmas straight or nearly so. 15. *T. grandiflorum*.
- Stamens 13 mm. long or less; stigmas more or less recurved. 16. *T. ovatum*.
- Stigmas united below into a short straight style.
- Leaves narrowly elliptic; peduncle erect; stamens straight. 17. *T. pusillum*.
- Leaves broadly elliptic; peduncle nodding; stamens curved.
- Filaments equaling the anthers. 18. *T. Catesbaei*.
- Filaments much shorter than the anthers. 19. *T. affine*.

# 1. *Trillium declinatum* (A. Gray) sp. nov.

*Trillium erectum declinatum* A. Gray, Man. ed. 5. 523. 1878.

Stem stout, smooth, erect, 2-3.5 dm. high; leaves broadly rhomboid, 8-12 cm. long and wide, narrowed at base, abruptly short-acuminate; peduncles horizontal or declined, 4-6 cm. long; petals ovate-oblong, white, 2-3.5 cm. long; filaments 2-5 mm. long, 30-50 per cent. as long as the anthers, which are 5-12 mm. long; ovary white or with a tinge of pink, deeply 6-winged; stigmas sessile, stout, thick at the base, tapering gradually to the recurved tip.

Type locality: Ohio.

Distribution: Ohio and southern Michigan to Missouri and southern Minnesota.

*Trillium declinatum* has heretofore been associated with *T. erectum*, but its affinities, as shown by distribution and structure, are much more with *T. cernuum*. *T. declinatum* also has a pleasant odor, wholly unlike the heavy, disagreeable odor of *T. erectum*.

2. TRILLIUM CERNUUM L. Sp. Pl. 339. 1753

Not *Trillium cernuum* Walt. Fl. Car. 126. 1788, nor Michx. Fl. Bor. Am. 1: 216. 1803.

Peduncle deflexed, 1-4 cm. long; filaments 3-6 mm. long, 67-120 per cent. as long as the anthers, which are 3-6.5 mm. long.

Type locality: Carolina.

Distribution: Nova Scotia to Manitoba; south to Minnesota, Michigan and Pennsylvania, and in the mountains to North Carolina and Georgia. This range lies entirely to the north and east of that of the preceding species, and the only herbarium evidence that they overlap at any place is from collections of both species made in the vicinity of St. Paul, Minnesota.

The most evident distinction between the two in fresh material is the position and length of the peduncle, nodding and short in *T. cernuum*, long and horizontal in *T. declinatum*. The length cannot be taken as an absolute criterion, since in exceptional cases it may fall within the normal limits of the other species, and the position may be changed by pressing. In dried material a safe character is the relative length of the filaments and anthers. Careful measurements of a large series of specimens show that in this the two species do not overlap, and the distinction is so obvious that measurements are virtually never necessary.

Linnaeus' description, as is now well known, referred to two species, this and *T. Catesbaei*. The type specimen, preserved in the Linnaean herbarium, is of the form usually regarded as *T. cernuum*, as has been recently shown by Rendle.

3. TRILLIUM VASEYI Harbison, Biltmore Bot. Studies 1:

24. 1901

Peduncle declined or horizontal, 5-8 cm. long; petals dark-red, ovate, 3.5-6 cm. long, 2.5-4 cm. wide; stamens much surpassing the stigmas; filaments and anthers about equal, each 8-12 mm. long.

Type locality: The southern Alleghanies.

Distribution: The lower Appalachian region, from Tennessee to Georgia and South Carolina.

The flowers are larger and the filaments longer in this than in any other red-flowered North American species.

#### 4. *Trillium simile* sp. nov.

Stem stout, erect, smooth, 3-4.5 dm. high; leaves very broadly rhomboid, abruptly narrowed at base, short-acuminate at apex, 10-18 cm. long and broad; peduncle 3-7 cm. long, declined or cernuous; petals white, broadly ovate, obtuse or subacute, 3-4 cm. long, 2-3 cm. wide; stamens much surpassing the stigmas; filaments 5-6 mm. long, about half as long as the yellow anthers, which are 10-12 mm. long; ovary dark-purple, deeply 6-lobed, the stigmas short, stout, sessile, tapering from the base to the recurved tip.

Type collected in moist woodlands near Tryon, North Carolina; *Biltmore Herbarium 14933A*, in the herbarium of the New York Botanical Garden. Other specimens of this species have been collected on Tryon Mountain, North Carolina, and in Fannin County, Georgia, by A. M. Huger, and at Biltmore, North Carolina.

In general habit it resembles closely *T. Rugelii*, but is distinguished by the much longer stamens, the yellow anthers and the proportionately longer filaments.

#### 5. *TRILLIUM RUGELII* Rendle, Jour. Bot. **39**: 331. 1901

Peduncle about 2 cm. long, nodding; petals broadly ovate, white; filaments 3-3.5 mm. long; anthers purple, 8-10 mm. long.

Type locality: Broad River, North Carolina.

Distribution: The mountains of western North Carolina and northern Georgia. The Georgia record is based on a fruiting plant, *Harper 1891*, from Randolph county.

#### 6. *TRILLIUM ERECTUM* L. Sp. Pl. 340. 1753

*Trillium pendulum* Willd. Gesell. Naturf. Berlin Neue Schr. **3**: 421. 1801.

*Trillium rhomboideum* Michx. Fl. Bor. Am. **1**: 215. 1803.

*Trillium rhomboideum album* Michx. Fl. Bor. Am. **1**: 215. 1803.

*Trillium foetidum* Salisb. Parad. Lond. *pl.* 35. 1806.

*Trillium obovatum* Pursh, Fl. Am. Sept. 245. 1814.

*Trillium erectum atropurpureum* Pursh, Fl. Am. Sept. 245. 1814.

*Trillium erectum album* Pursh, Fl. Am. Sept. 245. 1814.

*Trillium purpureum* Kin; Ell. Sk. 1: 430. 1817.

*Trillium erectum viridiflorum* Hook. Bot. Mag. *pl.* 3250. 1833.

*Trillium erectum flavum* Torr. Fl. New York 2: 296. 1843.

*Trillium album* Small, Fl. S. U. S. 278. 1903.

Peduncle 2–8 cm. long, erect or nearly so; petals ovate to narrowly oblong, dark-purple, white or greenish-white; anthers 5–9 mm. long, once and a fourth to twice as long as the filaments.

Type locality: Virginia.

Distribution: New Hampshire to Ontario, south to Pennsylvania, and in the mountains to Virginia, West Virginia and North Carolina; nearly all of its range lies in the Atlantic watershed.

The species is very variable in the color, size, and shape of the petals, but the different forms so intergrade that specific separation is impossible. Of the forms described by Rendle, number 2 apparently refers to the plant described in this paper as *T. declinatum*. A plate of Willdenow's illustrating his *T. pendulum* leaves no doubt of its identity with the white-flowered form of *T. erectum*, but later usage of the name may possibly refer in part to *T. cernuum*. Terms have been somewhat confused so that no distinction is made between a nodding or pendulous peduncle, hanging below the leaves, and a nodding flower upon an erect peduncle. There is some doubt also concerning the species described as *T. obovatum* by Pursh. It had white, obovate petals, and in this resembles *T. grandiflorum*, but various authors have since regarded it as synonymous with *T. erectum*, and it will be so treated here. Under either interpretation it has no bearing on the nomenclature of any species.

#### 7. TRILLIUM SMALLII Maxim. Mel. Biol. 11: 862. 1883

Petals none or abortive: anthers short, dilated, blunt, about 3–4 mm. long.

Type locality and distribution: Japan.

Rendle would consider this but a form of *T. Tschonoskii*, with reduced or abortive petals. This peculiarity, however, seems to

be constant, and in addition the anthers are totally different from those of *T. Tschonoskii*.

8. TRILLIUM TSCHONOSKII Maxim. Mel. Biol. **11**: 863. 1883

*Trillium erectum album* A. Gray, in Perry, Narr. Exped. China and Japan **2**: 320. 1856. Not *T. erectum album* Pursh.

*Trillium erectum japonicum* A. Gray, Mem. Am. Acad. **6**: 413. 1859.

Peduncle usually only 1–4 cm. long; petals white; flower much smaller than in *T. erectum*.

Type locality: Japan.

Distribution: Japan and China.

9. TRILLIUM CAMSCHATCENSE Ker, Bot. Mag. *sub pl.* 855. 1805.

*Trillium obovatum* Pursh, Fl. Am. Sept. 245, in part. 1814.

*Trillium camtschaticum* Pallas; Pursh, Fl. Am. Sept. 246, as a synonym. 1814.

Type locality: Kamtschatka.

Distribution: China, Japan, and eastern Siberia.

10. TRILLIUM GOVANIUM Wall. Cat. no. 812. 1828. — Royle, Illustr. Bot. Himal. 384. *pl. 93. f. 1.* 1839

*Trillidium Govanianum* Kunth, Enum. Pl. **5**: 120. 1850.

Type locality and distribution: The Himalaya Mountains.

11. TRILLIUM RIVALE S. Watson, Proc. Am. Acad. **20**: 378. 1885

Type locality: California.

Distribution: California and Oregon.

The slender stem and peduncle do not exceed 2 dm. in height; the leaves are 3–5 cm. long and evidently petioled. The material available for examination is in poor condition, and the species is associated with *T. nivale* and *T. undulatum* from Watson's statement alone. The stigma is said to be short, and the ovary narrowed at the tip; in both of these characters it is quite unlike *T. nivale*.



12. *TRILLIUM NIVALE* Riddell, Syn. Fl. West. St. 93. 1835

Type locality: Central Ohio.

Distribution: Western Pennsylvania to southeastern Minnesota, a range nearly coinciding with that of *T. declinatum*.

13. *TRILLIUM UNDULATUM* Willd. Gesell. Naturf.

Berlin Neue Schr. 3: 422. 1801

*Trillium erythrocarpum* Michx. Fl. Bor. Am. 1: 216. 1803.

*Trillium pictum* Pursh, Fl. Am. Sept. 244. 1814.

Type locality: Pennsylvania.

Distribution: Nova Scotia to Ontario and Wisconsin, and south in the mountains to South Carolina and Georgia.

14. *Trillium Scouleri* Rydberg, sp. nov.

*Trillium grandiflorum* Hook. Fl. Bor. Am. 2: 180, in part. 1839.

Not *T. grandiflorum* Salisb.

*Trillium obovatum* Hook. loc. cit. in part. Not *T. obovatum* Pursh.

Stem stout, erect, 2-4 dm. high; leaves broadly rhomboid, 6-12 cm. long and wide, acute or short-acuminate, rounded or truncate at base, closely sessile; peduncle erect or nearly so, 3-5 cm. long; petals ovate-oblong, white, subacute, 3-5 cm. long, 1-2 cm. wide; stamens 13-24 mm. long, equaling or exceeding the stigmas; filaments 5-9 mm. long, about one-half to two-thirds as long as the anthers; stigmas slender, recurved at the tip, erect, or usually divergent, about equaling the ovary.

Type locality: British Columbia.

Distribution: British Columbia to Montana and California.

15. *TRILLIUM GRANDIFLORUM* (Michx.) Salisb. Parad.

Lond. pl. 1. 1805

*Trillium rhomboideum grandiflorum* Michx. Fl. Bor. Am. 1: 216. 1803.

*Trillium erythrocarpum* Ker, Bot. Mag. pl. 855. 1805. Not *T. erythrocarpum* Michx.

Type locality: The mountains of North Carolina.

Distribution: From Quebec and New England west to Minnesota, and south along the mountains to Florida.

## 16. TRILLIUM OVATUM Pursh, Fl. Am. Sept. 245. 1814

*Trillium californicum* Kellogg, Proc. Calif. Acad. 2: 50. 1863.*Trillium crassifolium* Piper, Erythea 7: 104. 1899.

Type locality: The Columbia River.

Distribution: British Columbia to Montana, Colorado, and California.

The three preceding species constitute a very well-marked natural group closely resembling each other in habit and flower-structure. In the western species the stigmas are usually somewhat spreading, while in *T. grandiflorum* they are normally erect and connivent. The latter is separated also by its geographical distribution. Aside from these the only reliable characters are found in the length of the filaments and anthers. Measurements of a series of herbarium specimens give the following results:

Species.	Filaments.			Anthers.		
	Maximum.	Mean.	Minimum.	Maximum.	Mean.	Minimum.
<i>T. Scouleri</i> .....	9	6.4	5	15	10.8	8
<i>T. grandiflorum</i> ...	11	9.1	6	13	10.4	8
<i>T. ovatum</i> .....	5	4.4	4	7	6.4	5

*T. crassifolium* Piper is founded on a small form of *T. ovatum* with thickish, shining, broadly ovate, closely sessile leaves. It has no definite morphological character to separate it from Pursh's species.

## 17. TRILLIUM PUSILLUM Michx. Fl. Bor. Am. 1: 215. 1803

*Trillium pumilum* Pursh, Fl. Am. Sept. 245. 1814.*Trillium texanum* Buckl. Proc. Acad. Philad. 1860: 443. 1861.

Type locality: South Carolina.

Distribution: Pine barrens of the southern Atlantic States. The species is little known and very poorly represented in American herbaria.

## 18. TRILLIUM CATESBAEI Ell. Sk. 1: 429. 1817

*Trillium cernuum* L. Sp. Pl. 339, in part. 1753.*Trillium nervosum* Ell. Sk. 1: 429. 1817.*Trillium stylosum* Nutt. Gen. 1: 239. 1818.

Type locality: South Carolina.

Distribution: North Carolina and Tennessee to Georgia and Alabama.

19. *TRILLIUM AFFINE* Rendle, Jour. Bot. **39**: 334. 1901

Type locality and distribution: Georgia.

No specimens have been seen which could be referred to this species, but Rendle's careful description makes it certain that it is quite distinct from *T. Catesbaei*.

#### SPECIES DUBIAE

The following species were all described by Rafinesque, with usually very imperfect characterizations. Accurate identification of them from the descriptions alone is impossible, although his statements as to the color of the petals make it probable that most of them refer to *T. erectum* or to *T. cernuum*.

*Trillium acuminatum*, Med. Repos. N. Y. II. **5**: 361. 1808.

*Trillium brevipetalum*, Med. Fl. **2**: 100. 1830.

*Trillium divaricatum*, loc. cit. 102.

*Trillium flavum*, loc. cit. 100.

*Trillium hamosum*, loc. cit. 101.

*Trillium latifolium*, loc. cit. 101.

*Trillium lirioides*, loc. cit. 100.

*Trillium nutans*, loc. cit. 99.

*Trillium obcordatum*, loc. cit. 101.

*Trillium spatulatum*, loc. cit. 101.

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